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TI Brazing paste for copper components

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AB The brazing paste consists of 50-95 Cu alloy powder and 5-50 wt.% carrier. The Cu alloy contains P 0.1-12, Sb 0.01-13, Sn 0.1-25, Ag 0.0001-15, Si 0.01-0.5, Zr .ltoreq.0.05, and Ni 0.1-10%. The carrier contains Me cellulose (I) 0.5-50, glucose .ltoreq.15, starch .ltoreq.20, and balance water. The paste is esp. suitable for brazing of elec. motor terminals. The paste permits brazing below 973 K to prevent embrittlement of the brazed contacts. A typical paste consists of 80 wt.% Cu alloy powder <400 .mu.m diam. and 20% carrier. The Cu alloy contains P 0.1, Sb 0.1, Sn 25, Ni 0.1, Si 0.5, Ag 15, and Cu 59.1%. The carrier consists of I 2, glucose 18, and water 80%.

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PASTE FOR SOLDERING HARD ELEMENTS OF COPPER
[Pasta do lutowania twardego elementów z miedzi]

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The object of the invention is a paste for soldering hard elements of copper, in particular, leads of electric motors.

A soldering paste containing by weight in its composition 50-80% powdered copper having a granulation of 5-200 μm , 3-10% phosphorus, 0.01-0.05% antimony, 10-30% flux, 5-15% hydrochloric acid and the remainder water is known from the Polish application No. P-248895 (published in BUP 2/86); it is used for joining parts and components, especially in the electrical engineering industry. Due to the phosphorus content in the said paste, it cannot be used for soldering steel elements because brittleness would occur in the iron phosphide layer. It can thus be assumed that this paste serves for soldering elements of copper and its alloys. As is evident from the application No. P-248895, the soldering paste is obtained by mixing powdered copper, powdered phosphorus and antimony with flux and hydrochloric acid and then adding water to the mixture. The use of the soldering paste thus obtained for soldering elements of copper and its alloys is not possible technically. During heating of the elements with the paste applied, phosphorus undergoes combustion during soldering at a temperature of only 713 K. Antimony melts at a temperature of 903 K while copper powder melts simultaneously with the soldered copper elements, and in soldering brass elements they melt earlier than the copper powder.

A soldering paste composition for soldering hard elements of copper and brasses is known from the Polish Patent No. 143 102. This paste is composed of 50-95 wt% binder alloy grains, preferably spherical of dimensions below 400 μm , containing by weight 2.0-8.0% phosphorus, 0.05-5.0% antimony, up to 10.0% tin, up to 5.0% silver, up to 0.20% silicon, up to 0.05% zirconium and the remainder copper, and 5-50 wt% vehicle containing known fluxes. This paste contains the known chloric and fluoric fluxes, causing corrosion of the soldered elements, which necessitates removal of the residues of these fluxes after soldering, while in the case of soldering machine elements, e.g., electric motors and transformers this is practically impossible.

The paste for soldering hard elements of copper according to the invention is composed of 50-95 wt% binder alloy grains, preferably spherical with dimensions below 400 μm , containing by weight 0.1-12% phosphorus, 0.01-13% antimony, 0.1-25% tin, 0.0001-15% silver, 0.01-0.5 % silicon, up to 0.05% zirconium, 0.1-10% nickel and the remainder copper and 5-50 wt% vehicle containing by weight 0.5-50% methyl cellulose, up to 15% glucose, up to 20% starch and the remainder water.

Due to its qualitative and quantitative composition, the soldering paste according to the invention is particularly well suited for soldering copper elements having small sections, e.g., copper wires having sections below 1 mm². In soldering copper conductors at temperatures equal to or exceeding 973 K, there is the danger of recrystallization of the copper, which causes brittleness in the soldered element. For the melting temperature to be lower than 973 K, it contains in its composition phosphorus, antimony and tin, which cause a lowering of the melting point of the binder alloy. Silicon and zirconium are modifiers of the binder alloy grains and reduce their size at the moment of crystallization by changing the surface tension at the crystallization boundary. Nickel and silver contribute to improving the mechanical properties of the binder, while nickel additionally activates the soldered surfaces and facilitates their wetting, which has particular significance in soldering small-section conductors.

The soldering paste according to the invention due to its composition makes it possible to solder copper elements having small sections at a temperature below 973 K, which prevents embrittlement of the soldered elements and assures a good mechanical strength of the joint and its good electrical conductivity. The vehicle used in the paste is completely nontoxic, odorless and noncorrosive, and binds the binder powder very well and maintains it permanently on the small sections of soldered ends.

Example 1

The soldering paste is comprised of 85 wt% of spherical grains of binder alloy having dimensions below 120 μm , containing by weight 5.8% phosphorus, 0.01% antimony, 10% tin, 6% nickel, 0.1% silicon, 0.04% zirconium, 0.0001% silver and 78.0499% copper and 15 wt% of vehicle having the composition by weight: 87.5% water and 2.5% methyl cellulose. The paste is obtained by mixing the vehicle constituents in the proper ratio and adding the appropriate amount of binder alloy powder to the vehicle to obtain the consistency of paste. Thin copper wires having a diameter of 0.1-1 mm² constituting the leads of electric motors are soldered with the paste obtained.

Example 2

The soldering paste is composed of 80 wt% spherical grains of binder alloy powder having dimensions below 400 μm , containing by weight 0.1% phosphorus, 0.1% antimony, 25% tin, 0.1% nickel, 0.5% silicon, 15% silver and 59.1% copper and 20 wt% vehicle with a composition by weight of 80% water, 2% methyl cellulose and 18 wt% glucose. Copper flat bars are soldered with a paste having the above composition.

Example 3

The soldering paste is composed of 85 wt% spherical grains of binder alloy powder having dimensions below 200 μm , containing by weight 12% phosphorus, 13% antimony, 0.1% tin, 0.0001% silver, 0.01% silicon, 0.5% nickel and 74.3899% copper and 15 wt% vehicle having a composition by weight of 78% water, 2% methyl cellulose and 20% starch. Copper rods are soldered with copper flat bars with the paste having the above composition.

Claim

Paste for soldering hard elements of copper, composed of 50-95 wt% binder alloy grains, preferably spherical having dimensions below 400 μm , containing in it composition zirconium in the maximum amount, 0.05 wt%, phosphorus, antimony, tin, silver, silicon and copper and 5-50 wt% vehicle, characterized in that the binder contains by weight 0.1-12% phosphorus, 0.01-13% antimony, 0.1-25% tin, 0.0001-15% silver, 0.01-0.5% silicon, up to 0.05% zirconium, 0.1-10% nickel and the remainder copper, while the vehicle contains by weight 0.5-50% methyl cellulose, up to 15% glucose, up to 20% starch and the remainder water.